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Proposed Re-evaluation Decision PRVD2013-02

Nucleopolyhedrovirus for Gypsy Moth Larvae

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Overview

What Is the Proposed Re-evaluation Decision?

After a re-evaluation of the microbial insecticide nucleopolyhedrovirus for gypsy moth larvae, i.e., *Lymantria dispar* multicapsid nucleopolyhedrovirus (LdMNPV), Health Canada's Pest Management Regulatory Agency (PMRA), under the authority of the *Pest Control Products Act* and Regulations, is proposing continued registration of products containing LdMNPV for sale and use in Canada.

An evaluation of available scientific information found that products containing LdMNPV do not present unacceptable risks to human health or the environment when used according to the revised label directions. As a condition of the continued registration of LdMNPV uses, new risk-reduction measures are proposed to be included on the labels of all products. No additional data are being requested at this time.

This proposal affects all end-use products containing LdMNPV registered in Canada. Once the final re-evaluation decision is made, the registrant will be instructed on how to address any new requirements.

This Proposed Re-evaluation Decision is a consultation document[1] that summarizes the science evaluation for LdMNPV and presents the reasons for the proposed re-evaluation decision. It also proposes additional risk-reduction measures to further protect human health and the environment.

The information is presented in two parts. The Overview describes the regulatory process and key points of the evaluation, while the Science Evaluation provides detailed technical information on the assessment of LdMNPV.

The PMRA will accept written comments on this proposal up to 45 days from the date of publication of this document. Please forward all comments to Publications (please see contact information indicated on the cover page of this document).

What Does Health Canada Consider When Making a Re-evaluation Decision?

The PMRA's pesticide re-evaluation program considers potential risks, as well as value, of pesticide products to ensure they meet modern standards established to protect human health and the environment. Regulatory Directive DIR2012-02, *Re-evaluation Program Cyclical Re-evaluation*, presents the details of the cyclical re-evaluation approach.

For more details on the information presented in this overview, please refer to the Science Evaluation section of this consultation document.

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1 "Consultation statement" as required by subsection 28(2) of the *Pest Control Products Act*.

What Is LdMNPV

LdMNPV is a naturally occurring baculovirus, which is used as a microbial pest control agent for the suppression of gypsy moth populations in North America. In Canada, LdMNPV is registered for restricted use in forests and woodlots. When applied by aerial application to forest trees, LdMNPV releases polyhedral inclusion bodies, which are ingested by gypsy moth larvae. The polyhedral inclusion bodies break down in the insect gut to release virions that infect the larvae and cause host death.

Health Considerations

Can Approved Uses of LdMNPV Affect Human Health?

LdMNPV is unlikely to affect your health when used according to the revised label directions.

Potential exposure to LdMNPV may occur when applying the product or by entering treated sites. LdMNPV is not registered for food use in Canada and, based on the registered use pattern, exposure from drinking water is expected to be limited and residential exposure is not expected. The PMRA considers two key factors when assessing health risks: the levels at which no health effects occur and the levels to which people may be exposed. The dose levels used to assess risks are established to protect the most sensitive human population (for example, children and nursing mothers). Only uses for which exposure is well below levels that cause no effects in animal testing are considered acceptable for continued registration.

The toxicity profile established for technical LdMNPV during the initial registration of products containing this active ingredient continues to meet the standards of modern science and current policy. For consistency with current labelling practices, revised toxicity hazard statements are proposed in addition to revised first aid statements as per Regulatory Directive DIR2007-01, *First Aid Labelling Statements*, published on 28 May 2007.

Occupational mixer/loader/applicator and postapplication exposure and risk assessments were conducted by the PMRA in 1996 during the initial registration of LdMNPV. These assessments continue to meet the standards of modern science and current policy and adequately encompass the registered use pattern for LdMNPV. Risks for occupational handlers or re-entry workers were not of concern provided mitigation measures are employed. For consistency with current labelling practices, revised label statements are proposed.

Environmental Considerations

What Happens When LdMNPV Is Introduced Into the Environment?

LdMNPV is unlikely to affect non-target organisms when used according to the revised label directions.

Based on the registered use pattern, environmental exposure is expected to be limited. Baculoviruses are found naturally in the environment, are specific to specific insects, and are not expected to affect non-target wildlife. For consistency with current labelling practices, revised environmental label statements are proposed.

Measures to Minimize Risk

Labels of registered pesticide products include specific instructions for use. Directions include risk-reduction measures to protect human health and the environment. These directions must be followed by law. As a result of the re-evaluation of LdMNPV, the PMRA is proposing to revise product label statements to reflect current practises.

Human Health

- Revised toxicity hazard and first aid statements
- Revise label statements regarding directions for use and personal protective equipment for workers

Environment

- Revised advisory label statements
- A submission to implement label revisions will be required within 90 days of finalization of the re-evaluation decision

Next Steps

Before making a final re-evaluation decision on LdMNPV, the PMRA will consider all comments received from the public in response to this consultation document. The PMRA will then publish a Re-evaluation Decision[2] that will include the decision, the reasons for it, a summary of comments received on the proposed decision and the PMRA's response to these comments.

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2 "Decision statement" as required by subsection 28(5) of the *Pest Control Products Act*.

Science Evaluation

1.0 Introduction

Nucleopolyhedrovirus for gypsy moth larvae, i.e., *Lymantria dispar* multicapsid nucleopolyhedrovirus (LdMNPV), is a naturally occurring baculovirus, which is used as a microbial pest control agent for the suppression of gypsy moth populations in North America. When applied by aerial application to forest trees, LdMNPV releases polyhedral inclusion bodies (PIBs), which are ingested by gypsy moth larvae. The PIBs break down in the insect gut to release virions that infect the larvae and cause host death. In Canada, LdMNPV is registered as an insecticide for use in forests and woodlots; however, since its initial registration it has only been applied experimentally in Canada.

Following the re-evaluation announcement for LdMNPV, the registrant of the technical grade active ingredient in Canada indicated that they intended to provide continued support for all uses included on the label of the restricted end-use product currently registered in Canada.

The purpose of this re-evaluation is to review existing information on the active ingredient, LdMNPV, and the currently registered LdMNPV technical and restricted class end-use products, to ensure that previous risk assessments meet the standards of modern science and current policy.

2.0 The Technical Grade Active Ingredient, Its Properties and Uses

2.1 Identity

Table 1 Identity of the Technical Grade Active Ingredient

Common name	Nucleopolyhedrovirus for Gypsy Moth Larvae
Function	Microbial pest control agent (viral insecticide)
Biological Name	*Lymantria dispar* (L.) (Lepidoptera: Lymantriidae), multicapsid nucleopolyhedrovirus (LdMNPV)
Biological Family	Baculoviridae
Genus	Alphabaculovirus
Registration Number	24778
Purity of the technical grade active ingredient	At least 1.0×10^{10} PIBs of LdMNPV per gram

Based on the manufacturing process used, impurities of human health or environmental concern as identified in the Canada Gazette, Part II, Vol. 142, No. 13, SI/2008-67 (2008-06-25), including Toxic Substances Management Policy (TSMP) Track 1 substances, are not expected to be present in the product.

2.2 Description of Registered LdMNPV Use

Currently registered products containing LdMNPV are listed in Appendix I. All current uses are being supported by the registrant and were, therefore, considered in the re-evaluation of LdMNPV.

LdMNPV is registered for restricted use on forests and woodlots. It is applied by aerial application at a rate of 5×10^{11} PIBs/ha per application, twice per year. The end-use product is formulated as a wettable powder with a guarantee of at least 1.0×10^{10} PIBs of LdMNPV per gram. The current Canadian use pattern for LdMNPV is summarized in Table 1 below.

Table 1. Summary of the LdMNPV use pattern

Common Name(s)	Nucleopolyhedrovirus for Gypsy Moth Larvae
CAS No.	Not Applicable
Use Site Category	Forests and Woodlots (Use Site Category 4)
Maximum Application Rate	5×10^{11} PIBs/ha per application; 2 times per year
Application Type	Aerial application only (fixed wing or rotary wing aircraft); Restricted use by or under direct supervision of the Canadian Forest Service in government sponsored gypsy moth management programs.

3.0 Human Health

Toxicology studies in laboratory animals describe potential health effects resulting from various levels of exposure to a substance and identify dose levels at which no effects are observed. Unless there is evidence to the contrary, it is assumed that effects observed in animals are relevant to humans and that humans are more sensitive to effects of a substance than the most sensitive animal species.

Exposure to LdMNPV may occur while working as a mixer/loader/applicator or by entering treated sites.

When assessing health risks, the PMRA considers two key factors: the levels at which no health effects occur and the levels to which people may be exposed. The dose levels used to assess risks are established to protect the most sensitive human population (for example, children and nursing mothers).

3.1 Toxicological Summary

A toxicology review of LdMNPV was conducted by PMRA in 1996. LdMNPV was not acutely toxic via the oral, dermal and inhalation routes of exposure. The virus was eliminated from test animals within 72 hours, and cleared from the lungs within 14 days. No signs of infectivity were noted. Among the studies reviewed, there was no eye or skin irritation; however, it was recommended that precautionary protective equipment be required for all biological products. It was non-toxic and non-infectious to mammalian cell lines. Based on the method of production (*in vivo*), microbial contamination was expected. Overall, it was concluded that LdMNPV was non-toxic and non-infectious to humans. As a result, toxicity endpoints for use in human health risk assessments were not established. It should be noted that in the precautions section of the end-use product label the following statements are present: "Disparvirus may be a skin and eye irritant" and "Disparvirus contains insect material and is a potential sensitizer". It is proposed to revise the hazard signal statements regarding eye irritation and potential sensitization on the end-use product label (see Appendix II).

3.2 PCPA Hazard Considerations

For assessing risks from potential residues in food or from products used in or around homes or schools, the *Pest Control Products Act* requires the application of an additional 10-fold factor to threshold effects. This factor should take into account completeness of the data with respect to the exposure of, and toxicity to, infants and children and potential pre- and post-natal toxicity. A different factor may be determined to be appropriate on the basis of reliable scientific data.

Furthermore, as the worker population could include pregnant women, it is necessary to afford adequate protection of the fetus, which may be exposed via its mother. Consequently, an additional uncertainty factor may be applied to worker exposure scenarios if available data identify concerns for potential effects on the young or if appropriate data are not available to adequately address the concerns.

Based on the toxicity database, the mammalian toxicity/pathogenicity of LdMNPV poses little risk to human health and safety. Toxicity endpoints have not been established for LdMNPV; therefore, application of the PCPA factor is not required.

3.3 Dermal Absorption

A dermal absorption factor was not determined for LdMNPV.

3.4 Occupational Exposure

Workers can be exposed to LdMNPV through mixing and loading or through applying the insecticide by air. Since it was concluded that LdMNPV was non-toxic and non-infectious to humans and no toxicity endpoints for use in human health risk assessments were established, the PMRA conducted a qualitative occupational exposure assessment for LdMNPV in 1996.

3.4.1 Handler and Postapplication Exposure and Risk

Based on the use pattern, there is potential for dermal, eye and inhalation exposure to handlers. However, based on the toxicology profile, LdMNPV is not likely to pose any significant health concerns. Any potential for mild skin or eye irritation, or potential sensitization following repeated exposure to the powder were addressed during the 1996 qualitative assessment by the recommended precautions currently on the end-use label (for example, gloves, dust mask or appropriate respirator, and goggles). Therefore, with appropriate personal protective equipment and warning statements, risks to handlers were not of concern. Postapplication exposure and risk was also not expected to be of concern.

Since the use pattern of LdMNPV has not changed since initial registration, the occupational handler and postapplication exposure scenarios assessed by the PMRA in 1996 encompass the currently registered uses. No further mitigation is proposed. However, it is recommended to revise the end-use product label statements to reflect current PMRA wording (see Appendix II). In addition, the minimum re-entry interval of 1 hour that is on the current end-use product label should be removed, since the review of the toxicological data base for LdMNPV is complete and the risk profile does not warrant further mitigation measures to protect workers and bystanders.

3.5 Non-occupational Exposure

3.5.1 Residential Exposure and Risk

Based on the use pattern residential exposure is not expected. LdMNPV is non-toxic and non-infectious to humans and no toxicity endpoints for use in human health risk assessments were established. However, as a precaution, a minimum re-entry interval of 1 hour following aerial application was required to avoid potential bystander exposure. As the review of the toxicological database for LdMNPV is complete and the risk profile does not warrant further mitigation measures to protect workers and bystanders, this statement should be removed from the end-use product label (See Appendix II).

3.5.2 Residue Limits in Food Commodities

LdMNPV is not registered for food use in Canada or in other countries; therefore, Canadian MRLs are not applicable.

3.5.3 Dietary Exposure and Risk

LdMNPV is not registered for food use in Canada and therefore no dietary risk assessment is required. Based on the registered use pattern of LdMNPV, a quantitative drinking water exposure and risk assessment has not been conducted by the PMRA. LdMNPV is a naturally occurring organism and is not expected to pose a risk to drinking water sources. No further mitigation is proposed.

3.5.4 Aggregate Exposure and Risk

Aggregate risk combines the different routes of exposure to LdMNPV. Short-term and intermediate-term aggregate risk assessments are comprised of contributions from food, drinking water and non-occupational exposure (dermal, inhalation).

Exposure through residential or food uses is not expected, and no toxicology end-points were established, thus, an aggregate risk assessment for LdMNPV is not required.

3.6 Cumulative Exposure and Risk

A common mechanism of action has not been found for LdMNPV and other pesticide products, nor is this active ingredient considered to produce a metabolite common to other pesticide active ingredients. LdMNPV is a highly specific baculovirus pathogen which targets gypsy moth larvae only. Therefore, a cumulative risk assessment is not required.

4.0 Environment

4.1 Environmental Fate and Environmental Exposure and Risk Assessment

An environmental evaluation of LdMNPV was conducted by the PMRA in 1996 for the original registration. Baculoviruses are found naturally in the environment, are specific to insects, and do not infect vertebrates or plants. Molecular analysis indicated that LdMNPV only infects *L. dispar* (gypsy moth). Toxicity to other terrestrial and aquatic invertebrates (including honey bees) was not expected. There was no expected effect on birds or wild mammals; however, each represented major methods for long and short range dispersal in the environment, respectively. A dietary study indicated that LdMNPV was not orally toxic to fish, and the baculovirus was not detected in the fish digestive tract. It was unlikely to be phytotoxic or phytopathogenic. Overall, the PMRA concluded that LdMNPV poses little risk to the environment when used as directed, and environmental fate studies were not required.

4.2 Overall Conclusions and Mitigation Measures

The environmental fate and exposure scenarios assessed by the PMRA in 1996 encompass the currently registered uses. No further mitigation is proposed. However, it is recommended to revise the end-use product label statements to reflect current PMRA wording (See Appendix II).

5.0 Value

LdMNPV is a naturally occurring, highly specific baculovirus pathogen that must be consumed by larvae to cause infection. It is widely acknowledged that baculoviruses can be as effective as chemical pesticides in controlling specific insect pests. However, the cost of treating a hectare of land with a baculovirus product is greater than that of an equally efficacious chemical treatment. Naturally occurring nucleopolyhedrovirus is the most common cause of the decline in outbreak gypsy moth populations. LdMNPV is used in areas where the application of broad-spectrum pesticides is not appropriate, for example, where non-target Lepidoptera species are of special

concern. Within areas where the gypsy moth is established, pest management activities have slowed the spread and reduced damage to the forests. The baculovirus, once applied, persists in the gypsy moth population and continues to kill in subsequent years. The viral infection also spreads to forests surrounding the sprayed area and may limit future gypsy moth outbreaks. Therefore, viral sprays may be suited to long-term gypsy moth population management.

6.0 Pest Control Product Policy Considerations

6.1 Toxic Substances Management Policy Considerations

The Toxic Substances Management Policy (TSMP) is a federal government policy developed to provide direction on the management of substances of concern that are released into the environment. The TSMP calls for the virtual elimination of Track 1 substances [those that meet all four criteria outlined in the policy, for example, persistent (in air, soil, water and/or sediment), bioaccumulative, primarily a result of human activity and toxic as defined by the *Canadian Environmental Protection Act*].

During the re-evaluation process, LdMNPV was assessed in accordance with the PMRA Regulatory Directive DIR99-03, *The Pest Management Regulatory Agency's Strategy for Implementing the Toxic Substances Management Policy*, and evaluated against the Track 1 criteria. The PMRA has reached the following conclusion:

LdMNPV does not meet all Track 1 criteria, and is not considered a Track 1 substance. The active ingredient is a biological organism and hence is not subject to the criteria used to define persistence, bioaccumulation and toxicity properties of chemical control products.

6.2 Contaminants and Formulants of Health or Environmental Concern

During the re-evaluation of LdMNPV, contaminants in the technical are compared against the *List of Pest control Product Formulants and Contaminants of Health or Environmental Concern* maintained in the *Canada Gazette*.[3] The list is used as described in the PMRA Notice of Intent NOI2005-01 and is based on existing policies and regulations including DIR99-03 and DIR2006-02, and taking into consideration the Ozone-depleting Substance Regulations, 1998, of the *Canadian Environmental Protection Act* (substances designated under the Montreal Protocol). The PMRA has reached the following conclusion:

- Technical grade LdMNPV does not contain any contaminants of health or environmental concern identified in the *Canada Gazette*.

The use of formulants in registered pest control products is assessed on an ongoing basis through PMRA formulant initiatives and Regulatory Directive DIR2006-02.

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3 *Canada Gazette*, Part II, Volume 139, Number 24, pages 2641–2643: *List of Pest Control Product Formulants and Contaminants of Health or Environmental Concern* and in the order amending this list in the *Canada Gazette*, Part II, Volume 142, Number 13, pages 1611-1613, *Part 1 Formulants of Health or Environmental Concern, Part 2 Formulants of Health or Environmental Concern that are Allergens Known to Cause Anaphylactic-Type Reactions and Part 3 Contaminants of Health or Environmental Concern.*

During the review process, the potential presence of impurities known to have, or suspected to have, health and/or environmental implications are assessed in accordance with DIR98-04[4].

Technical grade LdMNPV is a microbial product, and based on the manufacturing process may contain microbial contamination.

7.0 Incident Reports

Since 26 April 2007, registrants have been required by law to report incidents, including adverse effects to health and the environment, to the PMRA within a set time frame. Registrants must also provide a scientific study they have sponsored if it indicates either a new health or environmental hazard, increased health or environmental risk or the presence of a component or derivative that has not been previously detected.

There are no reports of incidents on file for LdMNPV as of 19 February 2013.

8.0 Organisation for Economic Co-operation and Development Status of LdMNPV

Canada is part of the Organisation for Economic Co-operation and Development (OECD), which groups 34 member countries and provides governments with a setting in which to discuss, develop and perfect economic and social policies.

As part of the re-evaluation of an active ingredient, the PMRA takes into consideration recent developments and new information on the status of an active ingredient in other jurisdictions, including OECD member countries. In particular, decisions by an OECD member to prohibit all uses of an active ingredient for health or environmental reasons are considered for relevance to the Canadian situation.

Nucleopolyhedrovirus is currently acceptable for use in other OECD countries, including the United States. No decision by an OECD member country to prohibit all uses of nucleopolyhedrovirus for gypsy moth larvae for health or environmental reasons has been identified.

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[4] DIR98-04, *Chemistry Requirements for the Registration of a Technical Grade of Active Ingredient or an Integrated System Product.*

9.0 Proposed Re-evaluation Decision

The PMRA has determined that products containing LdMNPV for sale and use in Canada are acceptable for continued registration with the implementation of the proposed risk-reduction measures. These measures are required to further protect human health and the environment. The labels of Canadian end-use product must be amended to include the label statements listed in Appendix II. A submission to implement label revisions will be required within 90 days of finalization of the re-evaluation decision. No additional data are being requested at this time.

10.0 Supporting Documentation

PMRA documents, such as Regulatory Directive DIR2012-02, *Re-evaluation Program Cyclical Re-evaluation*, and DACO tables can be found on the Pesticides and Pest Management portion of Health Canada's website at healthcanada.gc.ca/pmra. PMRA documents are also available through the Pest Management Information Service—phone: 1-800-267-6315 within Canada or 1-613-736-3799 outside Canada (long distance charges apply); fax: 613-736-3798; e-mail: pmra.infoserv@hc-sc.gc.ca.

The federal TSMP is available through Environment Canada's website at www.ec.gc.ca/toxics.

The USEPA documents for the registration review of LdMNPV are available at www.regulations.gov (Docket ID: EPA-HQ-OPP-2011-0694).

List of Abbreviations

°C	degree(s) Celsius
DACO	data code
g	gram(s)
ha	hectare
kg	kilogram(s)
L	litre(s)
LdMNPV	*Lymantria dispar* multicapsid nucleopolyhedrovirus
MRL	maximum residue limit
OECD	Organisation for Economic Co-operation and Development
PCPA	*Pest Control Products Act*
PIBs	polyhedral inclusion bodies
PMRA	Pest Management Regulatory Agency
PRVD	Proposed Re-evaluation Decision
TSMP	Toxic Substances Management Policy
USEPA	United States Environmental Protection Agency

Appendix I Registered Products Containing LdMNPV as of 19 February 2013

Registration Number	Marketing Class	Registrant	Product Name	Formulation Type	Guarantee*
24778	Technical	Natural Resources Canada	Disparvirus Technical	Wettable powder	1.0×10^{10} PIBs/gram
24869	Restricted	Natural Resources Canada	Disparvirus Nucleopolyhedrovirus for Gypsy Moth Larvae	Wettable powder	1.0×10^{10} PIBs/gram

*PIBs – Polyhedral Inclusion Bodies of *Lymantria dispar* Nucleopolyhedrovirus

Appendix II Label Amendments for Products Containing LdMNPV

The label amendments presented below do not include all label requirements for individual end-use products, such as first aid statements, disposal statements, precautionary statements and supplementary protective equipment. Information on labels of currently registered products should not be removed unless it contradicts the above label statements.

A submission to request label revisions will be required within 90 days of finalization of the re-evaluation decision.

The labels of end-use products in Canada must be amended to include the following statements to further protect workers and the environment.

I) On the principal display panel of both the technical product and the end-use product labels:

The following hazard signal words must be included.

CAUTION – EYE IRRITANT

POTENTIAL SENSITIZER

II) On the secondary display panel of both the technical and end-use product labels the following must be removed:

FIRST AID: In case of contact with skin or eyes, flush with water. If irritation or sensitization occurs and persists, seek medical attention, or contact Poison Control Centre immediately. Take container, label or product name and Pest Control Registration Number with you when seeking medical attention.

And replaced with:

FIRST AID:

If swallowed: Call a poison control centre or doctor immediately for treatment advice. Have person sip a glass of water if able to swallow. Do not induce vomiting unless told to do so by a poison control centre or doctor. Do not give anything by mouth to an unconscious person.

If on skin/clothing: Take off contaminated clothing. Rinse skin immediately with plenty of water for 15–20 minutes. Call a poison control centre or doctor for treatment advice.

If inhaled: Move person to fresh air. If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably by mouth-to-mouth, if possible. Call a poison control centre or doctor for further treatment advice.

If in eyes: Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye. Call a poison control centre or doctor for treatment advice.

General: Take container, label or product name and Pest Control Product Registration Number with you when seeking medical attention.

TOXICOLOGICAL INFORMATION: Treat symptomatically.

III) In the **PRECAUTIONS** section of the end-use product label the following must be removed:

When handling this product and spray mixtures, gloves, a dust mask or appropriate respirator, and goggles should be worn.

And replaced with:

Mixers and loaders: Wear a long sleeved shirt, long pants, shoes plus socks, waterproof gloves and a dust/mist filtering respirator/mask (NIOSH approval number prefix TC-21) or NIOSH approved respirator with any N-95, R-95, P-95 or HE filter for biological products when mixing and loading the product and during clean-up/repair activities. Wash thoroughly with soap and water after handling.

IV) In the **PRECAUTIONS** section of the end-use product label the following statements must be removed:

To avoid bystander exposure people should not enter treated areas during application and for 1 hour following the application.

Avoid contamination of water bodies during cleaning of equipment or disposal of waste.

V) The following wording must appear on the secondary display panel of the end-use product label and be circumscribed by a line (i.e., wording must appear in a box):

RESTRICTED USES
FORESTRY

NOTICE TO USER: This pest control product is to be used only in accordance with the directions on the label. It is an offence under the *Pest Control Products Act* to use this product in a way that is inconsistent with the directions on the label. The user assumes the risk to persons or property that arises from any such use of this product.

NATURE OF RESTRICTION: This product is to be used only in the manner authorized; consult local provincial pesticide regulatory authorities about use permits that may be required.

RESTRICTED USE: For use by or under the direct supervision of the Canadian Forest Service in government sponsored gypsy moth management programs; for aerial application only in forests and woodlands management.

Mode of action: Disparvirus is highly specific to gypsy moth larvae. The active ingredient in Disparvirus is an insect virus that is contained within polyhedral inclusion bodies. These inclusion bodies must be eaten by susceptible larvae to cause infection. The protein of the inclusion bodies dissolves in the insect gut releasing the infectious virus particles which then penetrate gut cells and start the cycle of virus infection. The virus replicates exclusively in the nucleus of susceptible insect cells. Death occurs in about 15 days.

This product is active only on gypsy moth larvae. To prevent defoliation where significant populations of other leaf chewing larvae are present, use of other registered products is necessary.

DIRECTIONS FOR USE
Apply only by fixed wing or rotary wing aircraft equipment which has been functionally and operationally calibrated for the atmospheric conditions of the treatment area and the application rates and conditions of this label. Consult the local Transport Canada office regarding low level flying regulations.

Read and understand the entire label before opening and mixing this product. Apply only at the rate recommended for aerial application.

Disparvirus is recommended for treatment of moderate density populations of gypsy moth. When used precisely according to the dose, timing and application instructions specified below, Disparvirus treatment of moderate gypsy moth populations may result in protection of oak foliage of at least 55-60% and reductions in egg mass density. The extent of egg mass density reduction and the need for retreatment in the following year is influenced by many variables,

especially the pre-spray egg mass density and the health of the gypsy moth population. Disparvirus is not recommended for use where the goal of aerial application is eradication of gypsy moth. Results of treatment may be unsatisfactory if egg hatch is significantly extended or when pre-spray populations exceed 10,000 egg masses per hectare.

Dose and Timing for Aerial Application

Disparvirus should be applied 2 times, at a dosage of 5×10^{11} PIBs/ha per application total 10^{12} PIBs/ha) in the specified spray mixtures, at an emitted volume of 5.0 L/ha with 3 – 4 days between applications. Timing of application is critical. Larvae should all be in their first instar and actively feeding at the time of first application. At the time of second application, it is expected that about 50% of larvae will have reached their second instar. Oak leaves should be at least 50% expanded at the time of application. Thorough, well distributed spray coverage is necessary to ensure that feeding larvae ingest a lethal dose of Disparvirus. Aircraft fitted with rotary atomizers should be used and droplets should be in the 100 – 150 micron range. Avoid application when significant rainfall is anticipated.

Spray Mixtures

Disparvirus powder may be applied by air using the aqueous spray mixtures specified below. For an emitted volume of 5 litres per hectare, use ___grams of this batch of Disparvirus per hectare to be treated, so as to obtain a final concentration of 10^{11} PIBs per litre of spray mix. To prepare 100 litres of spray mix, add _____grams of this batch of Disparvirus to 10 litres of water and mix well to obtain a consistent, uniform slurry. Use of non-chlorinated water is preferred. If only chlorinated water is available, it must be allowed to stand for 24 hours before mixing with Disparvirus.

Commercial Carrier: Prepare 100 litres of aqueous formulation by adding the 10 litres of Disparvirus aqueous slurry to 90 litres of Carrier 038 (Abbott Laboratories). This spray mix should be discarded if not used within 24 hours of mixing. Although field trials have not been conducted with Disparvirus in this carrier, it is expected to perform as well as the basic spray mix. Consult the manufacturer (Abbott Laboratories) for advice regarding handling, mixing and aerial application of the carrier. Increased viscosity of the carrier may occur at low (<6°C) temperatures.

Basic Spray Mix: To prepare 100 litres of basic spray mix, add a further 62 litres of water and 6.0 kg Orzan LS (I.T.T. Rayonier, Seattle, WA) to the 10 litres of Disparvirus aqueous slurry. **MIX THOROUGHLY**. The Orzan LS is essential as an ultraviolet protectant. Then add 25 litres of animal feed grade molasses and 2.0 litres of Bond sticker (Loveland Industries, Greeley, CO). This spray mix should be discarded if not used within 12 hours of mixing.

This product should not be mixed with any materials other than those listed on this label.

DO NOT contaminate irrigation or drinking water supplies or aquatic habitats by cleaning of equipment or disposal of wastes.

As this product is not registered for the control of pests in aquatic systems, **DO NOT** use to control aquatic pests.

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